Section of Epidemiology and State Medicine

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[*May* 27, 1938]

The Incidence of Tonsillectomy in School Children

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THE rise in the incidence of tonsillectomy is one of the major phenomena of modern surgery, for it has been estimated that 200,000 of these operations are performed annually in this country and that tonsillectomies form one-third of the number of operations performed under general anæsthesia in the United States. There are, moreover, features in the age, geographical and social distribution of the incidence, so unusual as to justify the decision of the Section of Epidemiology to devote an evening to its discussion.

HISTORY

It seems unnecessary to review the history of operative treatment of the tonsil, and I will confine myself to pointing out that while it was natural that, in pre-anæsthetic and pre-Listerian days, the incidence of operation should be very small, it is astonishing to find how recent is the great vogue of the operation. For many years after the introduction of anæsthesia and aseptic surgery the incidence remained low. In 1885 that great physician Goodhart [14] said, " It is comparatively seldom that an operation is necessary, and fortunately so, for parents manifest great repugnance to it. Children grow out of it, and at 14 or 15 years of age the condition ceases to be a disease of any importance ". These words were repeated in several subsequent editions.

In 1888 I went to a preparatory boarding school of 50 boys, and then, in 1890, to a public school of 650 boys. Though, as the son of a doctor and destined for the profession myself, I took some interest in medical matters even then, I cannot recall a single boy in either school who had undergone the operation. Both schools still flourish, but the percentage of tonsillectomized boys is now in both alike about 50%, and, as we shall see later, even this is nowadays a low figure for schools of these types.

Old photographs reveal little difference in appearance between the untonsillectomized fathers and the tonsillectomized sons, and although the latter seem to grow taller and heavier than we did, memory suggests that we were at least as resistant to infection.

EARLY ESTIMATES OF THE NEED FOR OPERATION

It is difficult to estimate the number of operations previous to the introduction of the School Medical Service. Any such estimate is derived either from estimates of the number of children whose tonsils are said to " require immediate operation " or from hospital records.

In 1903 the Report of the Royal Commission on Physical Training (Scotland) gave the age-and-sex grouped results of the examination of 600 Edinburgh and 600 Aberdeen school children, in tables, which showed well the two periods of physiological

enlargement. The total percentages of children[1] with enlarged tonsils are in Edinburgh, 30·3, and in Glasgow, 21·2. All enlargements, however slight, are included. "About one-fifth to one-fourth, that is about one in twenty, of all the children examined would probably have benefited by surgical treatment".

Thus some 6% in Edinburgh and 4% of the Aberdeen children were thought probably to require operation. The high figures for the girls at puberty suggest that many cases of physiological enlargement have been included. By way of contrast, twenty-eight years later, i.e. in 1931, the School Medical Officer for London [21], stated that more than 33% of London elementary school children had been operated upon by the time they left school at 14 years.

This London figure of over 33% is much the same as the mean (32%) of the Edinburgh and Aberdeen children at age 12–15, but whereas in 1903 it was thought that only one-fifth of this 32% would probably have benefited by operation, in 1931 more than 33% of London elementary school children had actually been operated upon.

Hospital Records

Before dealing further with records from the School Medical Service, I turn to those from hospitals. T. Jefferson Faulder [11] in 1910 estimated that in twenty-five London "institutions" 23,979 operations were done in a year. He points out the difficulty of estimation arising from the fact that, at that time, and, indeed, up to comparatively recent years, many tonsil operations were performed in out-patient departments, for which incomplete or no records have been kept. Latterly a fuller appreciation of the risks of the operation, risks repeatedly emphasized by the Board of Education, has caused most authorities to arrange for admission of all patients. Thus Mr. P. B. Ashcroft tells me that, at the Middlesex Hospital in 1927, there were 586 tonsil operations on children, all in the out-patient department. In 1937 there were 352, all on children admitted as in-patients.

The following very incomplete table suggests the rapid rise in vogue of the operation at the beginning of the twentieth century, the comparative slackening during the War years, the high tide of 1931, and the subsequent ebb.

For the information therein I am greatly indebted to Dr. G. Ewart Martin and Miss R. McGlashan as regards the Royal Infirmary, Edinburgh; to Dr. P. Mallam and Mr. A. G. E. Sanctuary as regards the Radcliffe Infirmary, Oxford; to Dr. J. Paterson and Mr. D. Owen Davies as regards the Hospital for Sick Children, Great Ormond Street; to Mr. P. B. Ashcroft for the numbers at the Middlesex Hospital.

Table I.—Rise and Fall in the Number of Operations at Certain Hospitals.

	Royal Infirmary, Edinburgh	Radcliffe Infirmary, Oxford	Hospital for Sick Children, Great Ormond St.	Middlesex Hospital
1895	21			
1897		14		
1907	792	235		
1911			1,819	
1917	1,381	352		
1927	2,923 (including 728 out-patient)	610		586 (all out-patients)
1931			4,019	
1932			3,619	
1933			3,666	
1934			3,378	
1935			3,058	
1936			2,963	
1937	2,046 (including 475 out-patient)	990		352 (all in-patients)

[1] Compare 33·4% London children, Thorne-Thorne, L., *B. M. J.*, 1904, April 9; 39·5% Leith children, W. Robertson, *ibid.*, 1907, February 23.

Records from the School Medical Service

The School Medical Service first became general in 1907, and was naturally confined in its early years mainly to inspection. The provision of treatment gradually followed and grants in aid of treatment having been first paid by the Board of Education in 1914, it was made compulsory in 1918. Full statistical returns of treatment are available from 1923.

In pre-War years emphasis seems to have been laid rather upon the incidence of adenoids than of tonsil conditions.

The rising tide of incidence.—After the War, during which there was a lull, a rapid rise to a peak in 1931 took place. This is shown in Table II.

Table II.—Number of Tonsillectomies Officially Recorded Annually in Public Elementary School Children for London and England and Wales Respectively.

		London	England and Wales
1919	...	11,817	42,004
1920	...	—	55,293
1923	...	7,656	47,685
1924	...	8,051	49,436
1925	...	12,179	60,871
1926	...	13,165	68,250
1927	...	14,843	80,548
1928	...	17,372	92,171
1929	...	17,186	97,518
1930	...	18,119	109,738
1931	...	18,178	110,239
1932	...	15,558	95,875
1933	...	11,436	77,564
1934	...	9,715	73,259
1935	...	9,959	73,763
1936	...	9,937	80,676
1937	...	10,198	84,414

In some of the early years of the School Medical Service it had seemed necessary to recommend further provision for the operative treatment of tonsils, but the tide rose so fast that in his Annual Report for 1923, Sir George Newman [17] issued the first of his many warnings against premature resort to operation. During that year nearly 48,000 tonsillectomies were performed upon elementary school children, the children operated upon forming 0·9% of all children in average attendance. Notwithstanding this warning, repeated almost every year, and reinforced by a memorandum from the Section of Laryngology of the Royal Society of Medicine, the number of operations mounted steadily until, in 1931, more than 110,000 operations were performed, i.e. on 2·2% of the children in average attendance. In his Annual Report for this year (1931, p. 50) Newman strongly urged a more conservative attitude towards operation, pointing out that as the normal school life of an elementary school child is nine years—from 5 to 14—the percentage subjected to the operation at some stage of their school life is much greater than the percentage in any one year. Indeed if the annual percentage were to remain constant, the percentage of children who undergo the operation at some time during their school life would be about nine times the annual percentage.

This strong admonition, combined with the work of Tilley [27], Paton [25], Layton [20], Warwick James [19], Bradley [2], Wilson [13], and others in this country, and of Cunningham [6] in America, together with the courageous example of Ash [1] in Derbyshire, exerted a definite influence upon medical opinion.

A considerable fall in the operation rate ensued in 1932 and continued until 1935 in England and 1936 in London. The rate is, however, now rising once more.

Sex incidence.—More boys are operated upon than girls. This fact appears in all series to which I have had access [2] and in which the sexes are given separately. Thus at the Cyril Henry Treatment Centre of the London County Council, Dr. C. J. Thomas tells me that 647 boys and 554 girls were operated upon in 1937.

In Minnesota, of 1,328 high-school students (11–20 years) 41·3% of boys and 33·3% of girls were tonsillectomized (Hewitt [18]). In English public boarding schools the present proportion is 58·2% of tonsillectomized boys and 50·1% of girls.

When it is remembered that (1) the incidence of acute tonsillitis in female children under 10 seems equal to or greater than that in male children in hospital patients (H. G. Close [4]), (2) the incidence of sore throat in girls in boarding schools is somewhat higher, and (3) the incidence of acute rheumatism in elementary school-girls is much higher than in elementary schoolboys, the lower incidence of tonsillectomy upon girls appears somewhat strange. The sex incidence of the operation seems worthy of more attention than it has received.

Age incidence.—This subject was admirably presented by T. Jefferson Faulder [11] in 1910. Paterson and Bray [24] in 1928, and E. M. Dearn [8] in 1930 also dealt with it, the first in children operated upon in the Hospital for Sick Children, Great Ormond Street, and Dearn in 1,002 children at the School Clinic, Newcastle-upon-Tyne. On the whole, however, the subject has received less attention than it merits, for although the function of the tonsil is unknown, its two periods of physiological enlargement, and its atrophy after puberty suggest that the age at which operation takes place may be of great importance in the result.

Many attempts to assess the after-effects of tonsillectomy lose much of their value, because they give no precise information as to the age of the children at operation. No " control " is of value unless the ages are the same as those of the operated children.

Table III gives the percentage age distribution in four series hitherto unpublished, for which I am indebted severally to Dr. J. N. Deacon, Dr. C. J. Thomas (for two), and Dr. J. Ferguson. Surrey seems to have a later age distribution than London, and the Woolwich girls, as they have a lower incidence, so have they a later age distribution, than Woolwich boys.

TABLE III.—PERCENTAGE AGE DISTRIBUTION.

Incidence of Tonsil Operations.

Author	J. N. Deacon	C. J. Thomas	C. J. Thomas	J. Ferguson
Date	1932	1937	1937	1937
Hospital or School Clinic	Redhill County Hospital, Edgware, Middlesex	London C.C. S.C. Woolwich boys	London C.C. S.C. Woolwich girls	Surrey C. S.C.
Number of children = 100	200	647	554	1,883
1 year	—	—	—	0·1
2 years	—	—	—	0·2
3 ,, ...	2	2·8	3·2	1·9
4 ,, ...	9	11·1	8·7	3·7
5 ,, ...	10	19·9	17·7	12·8
6 ,, ...	25·0	17·0	15·9	24·7
7 ,, ...	16·5	16·8	16·8	17·4
8 ,, ...	15	9·9	9·4	14·5
9 ,, ...	8·5	7·0	4·9	7·8
10 ,, ...	2	4·9	5·1	4·5
11 ,, ...	5	4·6	8·3	4·1
12 ,, ...	2·5	1·5	3·4	5·0
13 ,, ...	6·5	3·1	5·1	2·1
14 ,, ...	2·5	1·1	1·6	1·1
15 ,, ...	1·5	—	—	0·2
Over 15	—	0·2	—	—

[2] Dr. W. Norman Pickles, M.O.H., of Aysgarth R.D.C., whose masterly paper on " Epidemiology in Country Practice " before this Section in 1935, *Proceedings*, **28**, 1337 (Sect. Epid., 37), will be remembered, has, however, been good enough to examine the children in four Council Schools in isolated villages in Wensleydale, and found in the total school population 3% of the boys and 7% of the girls tonsillectomized—a total rate and not an annual rate, be it noted. These figures are remarkable not only because they are low, but in that the girls have more than twice the proportion tonsillectomized than the boys. In a secondary school he found 16% of the boys and 18% of the girls tonsillectomized.

In these new series, as in the old to which I have referred, there is a period of the highest incidence between 5 and 7 years. This period in the life-history of a child is a time of great change alike in his oral cavity and in his general development. His environment also changes, and instead of the familiar "herd" infections of the home, he encounters for the first time the many varied infections of the much larger "herd" of school. That so great a proportion of tonsillectomies should be performed during such a period seems to raise questions of importance.

Function and Physiological Enlargement of the Tonsil

If, as some believe, the tonsils have a protective function, "absorbing small numbers of organisms and so establishing immunity by gradual dosage" (I. Griffith [15]), the child's entry to the new environment of school might seem the time when they are most likely to be useful.

"To me", says L. W. Dean [7] "it is certain that the tonsils in infancy and early childhood are part of the defence mechanism of the body. They protect the organism against those factors which cause them to become acutely swollen."

If so, it may be that the fate of some tonsils is as unjust as that of Llewellyn's hound Gelert. If, again, there be a period of physiological enlargement of the tonsil between 4 and 6 years, such an age distribution of operation seems, *prima facie*, open to question.

Is it not possible that many of the operations performed at this age of rapid development remove tonsils which are enlarged physiologically or in response to their protective function? May not some of the improvement ascribed in such cases to tonsillectomy be really due to physiological changes which normally take place at this stage in the child's life—the critical age of 7 according to Hippocrates. Later authorities, e.g. H. A. Harris [16], regard it as one of transition from the second "springing-up" period, which ends at 7, to the beginning of the second "filling-out" period from 8 to 10 years.

The fact that in the inquiry [26] into the "catarrhal child", the "unselected" control children showed a higher percentage of enlarged tonsils and adenoids than did the "catarrhal" children seems to support the theory that some physiological enlargement of the tonsil occurs between 4 and 6 years.

But to the many—parents or practitioners—to whom enlargement at any age seems always pathological, a study of the work of K. H. Digby [8A], or that of Cunningham [6] on female students in California University may be commended, or of that of E. Neuber [23] in Hungary, who found that in the lower forms of elementary schools children with "hypertrophic" tonsils had a greater average height and weight than those with "normal" tonsils.

Ellis and Russell [9] recently have given us a new and much-needed view of the value of the tonsil.

Speaking of the 4,000 Basque children who had come out of siege conditions and terrible overcrowding to Southampton they say:—

"Another revealing feature of the group was the appearance of the children's throats. Less than 2% had had tonsillectomies performed, and in a very great number of cases the tonsils were as large or larger than walnuts. But the incidence of both cervical adenitis and otorrhœa was only approximately 0·4%, and that of obvious respiratory infection almost incredibly low. The same is true of nasal discharges and respiratory obstruction. The important question arises as to what will happen to these children now they have reached England. Owing to the difficulty of obtaining parents' consent to operation, it is devoutly to be hoped that they will retain their tonsils, since it might well prove disastrous if these were to be removed before the children had had opportunity of acquiring general immunity to catarrhal infections. (It is also perhaps of interest that of the 200 adults examined none showed appreciably enlarged or unhealthy tonsils.)"

The present early age distribution of operation has been criticized by Layton [20], and more recently I. M. Epstein [10] has convincingly shown that, even in the most carefully selected series of cases, much better results were obtained in children between 6 and 10 years, than in children under 6.

Geographical Distribution

Abroad

The incidence of operation seems to be quite as high in the United States generally as in this country.

In Minnesota [18], of 1,328 high-school students (11–20 years), 41·3% of the boys had had their tonsils removed, the corresponding figure for the girls being 33·3%. Collins [5] found that 61% of the children, from 10–14 years, of medical officers of the Army, Navy, and public health services, had been tonsillectomized, while Cunningham [6] found that one-third of 12,530 young white women students who entered the University of California between 1920 and 1929 had had an operation for the removal of tonsils ; one-third were thought to have normal tonsils, and the remaining one-third had " pathologic " tonsils, including remnants of tonsils or buried or projecting tonsils.

But even in the States there are contrasts, and in the country districts of south-eastern Missouri only 2% of school children were tonsillectomized in 1931. In 1932 Dr. Gustav Seiffert, the then medical officer of health for Munich, told me that in that city not more than 0·5% of secondary school children had been tonsillectomized, whilst in the country districts around hardly any children had had the operation.

England and Wales

The Reports of the Chief Medical Officer as early as 1912 (p. 44) showed the great local variations in the proportion of children recommended for operation. As the provision of treatment has been increased, these variations have not diminished but increased. As it is not possible to obtain the proportion of tonsillectomized children in an area by other means, the number of children operated upon in each area in a year, expressed as a percentage of the children in average attendance in that area, forms a convenient index wherewith to compare the geographical variations in incidence. Both figures are approximately accurate. To estimate roughly the total proportion of children tonsillectomized during their elementary school life (i.e. from 5–14 years) this annual incidence rate x may be multiplied by nine. Assuming that the annual rate remains fairly constant (as we shall see it does) this product ($x \times 9$) will be roughly comparable to the proportion of tonsillectomized children found on entry at 14 to public boarding schools, of which more hereafter.

The annual incidence rate for elementary school children in England and Wales in 1923 was 0·9% ; in seven years it more than doubled, and in 1930 and 1931 was 2·2%. Comparisons of some of the rates in different areas in 1931, the peak year of incidence, revealed striking contrasts in areas apparently somewhat similarly circumstanced. Thus in that year the operation rate in Margate was eight times that in Ramsgate ; that of Enfield was six times that of Wood Green and four times that of Finchley ; that of Bath five times that of Bristol ; that of Guildford four times that of Reigate ; that of Salisbury three times that of Winchester.

For the year 1936 the operation rates for all local education authorities in England and Wales were tabulated for comparison.

For comparative purposes it would no doubt be better to use an average rate for several years, rather than the rate for a single year. This would, however, have much

increased the work, and as the rates generally remain relatively constant in most areas, the disadvantage of a single year rate is less than might be anticipated. A large or sudden change usually denotes a change of medical officer—occasionally, increased facilities for operation.

Table IV shows this relative constancy by comparing the single year rate for 1936 with the average of the rates for the five years 1932–36 in ten areas of different type, six with rather high rates, and four with rather low rates. In only two is the difference significant, or sufficient to change the colouring of the area one degree on the maps which I show.

TABLE IV.—COMPARISON OF 1936 RATE WITH AVERAGE OF RATES FOR THE FIVE YEARS 1932-36.

Area	1936 rate	Average of rates 1932-36
Sussex W.C.	2·4	2·5
Hampshire C.	1·0	1·0
Rutland C.	5·1	5·0
Cambridge C.	0·3	0·3
Oxford C.B.	3·1	2·2
Cambridge B.	1·0	1·7
Royal Tunbridge Wells B. ...	4·0	3·4
Margate B.	2·5	2·2
Ramsgate B.	0·5	0·5
Enfield U.D.	4·0	3·8

An Examination of the Rates in 1936.

For all England and Wales, the average was 1·7%. In the English Counties (excluding London) the average was 1·5% ; for the English County Boroughs it was 1·7% ; for English Boroughs 1·8% ; for Urban Districts 2·0% ; for London 2·2%. In Wales the averages for the Counties and for the County Boroughs were the same as for the English Counties and County Boroughs. The Welsh Boroughs gave a percentage of 2·2, but the Urban Districts only a percentage of 1·5.

In each of these categories there are extreme variations in the operation rate, the extremes often being in adjacent areas. As regards England, these rates have been examined to see whether correlation could be obtained with any factor which might have some ætiological bearing on chronic tonsillitis and adenoidal growths—such factors for example as overcrowding and unemployment. Other possible factors, such as the efficiency of the school dental service, rainfall, climate, and nutrition returns have been considered, but with one extremely doubtful exception—urbanization—not the slightest suggestion of correlation has been obtained. Urbanization, which for many years has been suspected as a factor, seems at first sight suggested by the County Boroughs having higher rates than the Counties, and London a higher rate than the aggregate County Boroughs. But if urbanization be a factor there are inexplicable anomalies, for the Boroughs and Urban Districts have higher average rates than the County Boroughs, the highest rates of all are in certain agricultural counties, and the Boroughs which have the higher rates include residential towns and health resorts famed for their beauty, climate, and spaciousness.

The following shows areas with exceptionally high rates in descending order :—

More than Three Times the Average Rate

Soke of Peterborough, 5·8; Rutland C., 5·8; Blyth B., 5·7; Wrexham B., 5·7; Abertillery U.D., 5·5; Bexhill B., 5·5.

Areas with More than Twice the Average Rate

Colne B. 4·2; Huntingdon C., 4·1; Leicester C.B., 4·1; Carlisle C.B., 4·0; Beverley B., 4·0; Tunbridge Wells B., 4·0; Enfield U.D., 4·0; Hebburn

U.D., 4·0; Folkestone B., 3·9; Poole B., 3·8; Royal Leamington Spa B., 3·8; Pembroke B., 3·8; Guildford B., 3·7; Pudsey B., 3·7; Rawtenstall B., 3·7; Exeter C.B., 3·6; Loughborough B., 3·4; Hastings C.B. 3·4; Leigh B., 3·4.

On the other hand 4 Counties, 4 County Boroughs, 11 Boroughs and 1 Urban District (this latter having a school population of 23,000) have rates *less than one-third of the average*, while in addition to these 3 Counties, 5 County Boroughs, 17 Boroughs and 2 large Urban Districts have rates *less than half the average.*

The school population in London and Greater London is so vast that I give their rates in full :—

Hornsey, 0·2; Wood Green, 0·4; Finchley, Edmonton, and Gravesend, 0·6; Acton and Walthamstow, 0·8; Leyton, 1·2; Hendon, 1·3; Beckenham, Richmond and Erith, 1·4; Kingston, Brentford, and Chiswick, 1·5; Heston and Isleworth, 1·6; West Ham and Twickenham, 1·8; Penge, 1·9; London C., 2·2; Barking, Croydon, East Ham, and Wimbledon, 2·3; Willesden, 2·7; Tottenham and Bromley, 3·3; Enfield, 4·0.

Neighbouring County rates are Middlesex, 1·0; Essex, 1·6; Herts and Surrey, 2·2.

Here are two large coloured maps [not reproduced], one showing rates in County areas, the other rates in the areas of all other Local Education Authorities. Epidiascope maps are also shown : (1) Greater London, (2) areas round Birmingham, (3) part of Lancashire, (4) Tyneside, (5) some rural counties of the Eastern Midlands.

The second of the large maps suggests a belt of high rates on the south coast, but apart from this, all show extreme variations apparently entirely unrelated to environment, circumstances, efficiency of school medical or dental services, or to any recognizable factor. Areas with the highest and the lowest rates are sometimes next-door neighbours. These rates are approximately accurate ; they rest on the real fact of operation, not on diagnosis or assessment. Where they err, they err on the small side, as some operations performed outside the School Medical Service may not be recorded.

These rates cannot therefore be open to the criticisms justly directed to certain statistics of the School Medical Service. Judged by a comparison of these rates for 1936, a child living in Rutlandshire or the Soke of Peterborough is nineteen times more likely to undergo tonsillectomy than one living in Cambridgeshire. An Enfield child is twenty times more likely to have the operation than one in Hornsey. A child living in Bexhill would seem to enjoy climatic and cultural advantages at least equal to those of a Birkenhead child, yet he is twenty-seven times more likely to be submitted to operation.

Let us leave annual rates for a moment and find by actual numbers of operations performed during a nine-year period (the period of a child's elementary school life) what these local variations really mean.

Let us take the nine years 1928–1936. For our first illustration we will take two rural counties A and B, not far apart and not unlike save in size.

During these nine years A, with an average attendance each year of about 2,207 elementary school children, during the nine years had 1,010 children operated upon. If B, with an average attendance of 8,621 children, had had operations in the same proportion as A, we should " expect " that 3,945 children in B would have been tonsillectomized during this period. But the actual number was 335. Environment and circumstance were not very different, so that it seems 3,610 children, who would have been operated upon had they lived in A, were not operated upon because they

lived in B. There is no evidence that more children under school age were operated on in B than in A, or that the children in B are different from those in A in race, or in nutrition, hearing, physical, or mental development. Nor is there any evidence that they have suffered more from running ears, enlarged glands, or rheumatism. The School Medical Service of B is efficient and centred in its county town, a great seat of medical science.

For a second illustration, C and D are "dormitory suburbs" on the north of London and immediate neighbours. During the nine years in question C had an average attendance of 8,450 and D 6,584. D is perhaps, on the whole, slightly more prosperous and better housed. During the nine years 4,055 of C's elementary school children were tonsillectomized. If D had had operations at the same rate as C, 3,160 D children would have been tonsillectomized. But the actual number was 290. D has an experienced aural specialist and again there is no evidence that the education or development of the D population has suffered and some 2,870 children living in D have escaped operation, who, it seems fair to assume, would have undergone it had they lived in C.

Reduction of Incidence Subsequent to 1931

Since 1931 most areas have shown a reduction, in some cases—for example, London and Wiltshire—substantial but gradual, but in others great and sudden. Of the latter type of reduction the first example was Hornsey Borough, where the reduction preceded the general movement by two years. Here Dr. Garrow in 1929, his first year as school medical officer, reduced the number of operations from 186 (2·9% of all children in average attendance) in 1928 (the average number for the seven years 1922–1928 being 169 (2·6%)) to 12 in 1929 and to an average for the eight years 1929–1936 of 13 (0·2%).

Judging by the returns for otitis media (which are now very low) and other conditions, nothing harmful, but rather the reverse, has happened from the substitution, in all but a most carefully selected fraction of cases, of conservative methods for operation, a substitution which has now been carried on for eight years. Diagram I

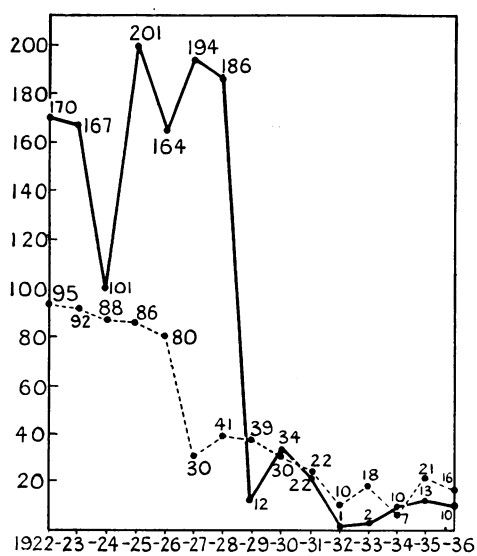

Diagram I.—Hornsey Borough, 1922-1936. To show the great reduction in the number of tonsil operations. The cases of otitis media show no tendency to increase. Continuous line = Numbers of tonsil operations each year. Interrupted line = Numbers of cases of otitis media found at routine and special inspections.

illustrates the yearly numbers of tonsil operations and cases of otitis media discovered at routine and special examinations. On a larger scale was the courageous reduction in Derbyshire initiated in 1932 by Dr. Ash. In this county area the operations in 1931 were 2,626, or 3·9% of all the 68,079 children in average attendance. In 1929 the number had been 2,240, and in 1930, 2,316.

Dr. Ash reduced the numbers to 1,187 in 1932; 523 in 1933; 156 in 1934; 178 in 1935; 193 in 1936; 164 in 1937. If the 1931 rate had been maintained, some 15,700 further children would have been tonsillectomized since the reduction began. The actual number operated upon is 2,401; 1,710 in the first two years. Thus it seems that since 1931 some 13,000 children in Derbyshire have been spared the operation. Here again there seems no evidence that any harm has been done, or any advantage lost.

This is of course no easy matter to decide, as it is impossible to assess such things as the frequency of sore throats and colds in a County area, but attendance has not suffered and compares well with the average. Some light, however, may be thrown on the prevalence of some of the other conditions for which tonsillectomy is performed—such as otitis media and enlarged cervical glands—by the numbers of cases found at routine and special inspections in the schools. Table V and Diagram II show that this

TABLE V.—DERBYSHIRE (Dr. W. M. ASH).

	Tonsils and Adenoids								Other Conditions			
	Children referred for treatment			Children referred for observation			Children operated upon					
Year	Routine	Special	Total	Routine	Special	Total	Number	Per cent. of average attendance	Defective hearing. Total cases*	Otitis media. Total cases*	Enlarged cervical glands. Total cases*	Attendance† Per cent. No. on Roll
1929	3,333	975	4,308	1,503	81	1,584	2,240	3·3	192	258	843	89·7
1930	3,597	739	4,336	1,784	78	1,862	2,316	3·4	246	228	959	90·7
1931	2,030	846	2,876	2,334	471	2,805	2,626	3·9	219	243	815	90·3
1932	398	180	578	2,629	843	3,472	1,187	1·7	230	266	851	91·1
1933	283	473	756	2,886	813	3,699	523	0·8	222	258	976	90·3
1934	189	119	308	1,425	202	1,627	156	0·2	203	277	617	92·0
1935	234	78	312	1,178	194	1,372	178	0·3	164	225	622	91·1
1936	238	66	304	1,285	177	1,462	193	0·3	137	150	632	90·5
1937	218	68	286	1,211	156	1,367	164	0·27	171	201	643	89·5

* i.e. including all cases seen at either routine or special examinations and whether referred for treatment or for observation.

† The average percentage attendance in English County Areas was 1935–6, 89·7; 1936–7, 88·7.

great diminution in tonsillectomy has, so far at any rate, not been accompanied by any increase in the numbers of the cases of deafness, otitis media, or enlarged non-tuberculous cervical glands. In considering the figures for enlarged cervical glands the great prevalence of scarlet fever in the years 1933 and 1934 will be remembered. Parenthetically, I should like here to say that the increased attention now being given to hearing defect consequent upon the introduction of audiometer testing (attention which will soon be further stimulated by the publication of a Report now in the press) is almost certain to render future returns as to defects of hearing much higher than of old. This in future may appear to show an increase in defects of hearing, the exact opposite of the truth; what will have increased is the accuracy of ascertainment, due partly to the audiometer testing each ear entirely separately.

Another example of great reduction is Norfolk. Operations in 1931 numbered 1,729 or 4·4%; they were halved in 1932, and appear to be stabilized at less than one-third, being 1·1% in 1936 and 1·5% in 1937.

No unsatisfactory reports have been received of the results of conservative treatment in any area. Dr. Bullough [3] (Essex) for example says: "No unsatisfactory

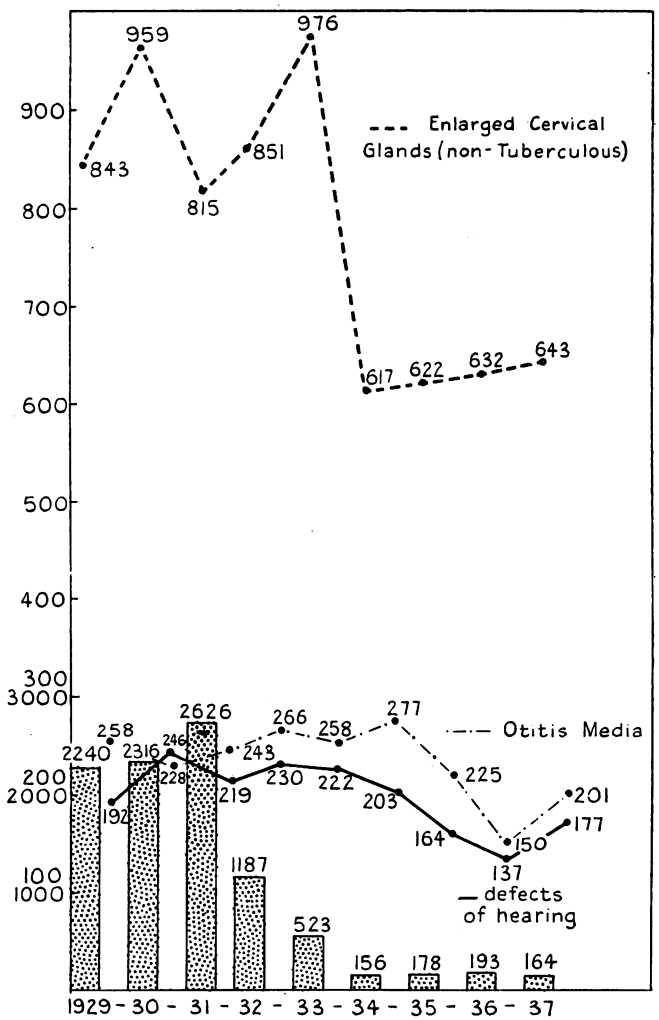

DIAGRAM II. Derbyshire.—To show that the great reduction in tonsillectomy in Derbyshire has not resulted in any increase in the numbers of cases (found at routine and special medical inspections) of defective hearing, otitis media, and enlarged (non-tuberculous) cervical glands. The columns representing numbers of tonsillectomies each year are on a scale of height one-tenth that of the curves of the other conditions. Percentage attendance is not shown, but is unaffected and is well above the average of English counties.

result has been seen from conservative treatment in a large number of cases, where the tonsils showed definite enlargement."

The Social Incidence of Tonsillectomy

The social incidence of tonsillectomy is the most puzzling feature of its ætiology.

Although tonsillitis seems common to all classes of society, the incidence of tonsillectomy is at least threefold heavier in the children of the well-to-do. The annual operation rate on elementary school children in England and Wales in 1936 was 1·7%. The average for the last nine years would be somewhat higher, and multiplying this by nine for the nine years of elementary school life and making some allowance for operations performed in the pre-school years, we may estimate that at the present time some 20% of elementary school children have been tonsillectomized before the age of 14. For the last seven years, of new boys just about the same age of 14 years, at one of our most famous public schools, the senior medical officer of the school tells me, 75% have been tonsillectomized before entry, and that his latest figures are 83%. This school is not one of those 17 public schools mentioned later.

In 1928 Paton [25] found in a large public boarding school for girls at St. Andrews, 42% of 424 girls were tonsillectomized before the age of 14 years.

The recently published Report [22] of the Schools Epidemics Committee of the Medical Research Council gives the following information relating to seventeen large public boarding schools for boys, and nine large public boarding schools for girls.

When the inquiry began in 1930, 52·5% of boys and 43·3% of girls had had their tonsils removed. In every subsequent census these proportions of tonsillectomized pupils increased, until in 1934 we find that the figure for the boys was 58·2%, and that for the girls was 50·1%, a rise of nearly 6·0 and nearly 7·0% respectively.

For the last two years of the inquiry a record was kept each term of the number of new entrants who had previously undergone tonsillectomy, and during this period an average of 59·2% of boys (boarding) and 45·3% of girls (boarding) were tonsillectomized before entry.

Between January 1930 and July 1934 16 of the 17 boys' boarding schools showed increases in the proportion of tonsillectomized pupils varying from 1·3% to 15·2%. Only one boys' school showed a reduction of 1·7%. Seven out of the nine girls' boarding schools showed increases varying from 2% to 12·2%. Two girls' schools showed decreases, one of 0·3%, the other of 2·8%.

At the end of the inquiry, the boys' school showing the highest proportion of tonsillectomized had 70·5% of all boys in the school tonsillectomized; the school[3] with the lowest proportion had 50·7%. Of the girls' schools the highest proportion was 63·6%, and the lowest 42·4%.

Incidence by physical type.—As regards boys' schools, Dr. Wilson and I found, in 1932, that, of the first fifteens and first elevens of eighteen public schools, 141 or 54·4% of these picked athletes were tonsillectomized. All boys of these schools at this time had a proportion of 54·7%.

Incidence of Mortality From Tonsillectomy in Children under 15 Years

Diseases of the tonsil.—Before coming to deaths directly assigned to tonsillectomy it may be well to remind you that deaths assigned to diseases of the tonsils have notably increased both in children under 15 and in adults. The Registrar-General's Statistical Review for 1935 states (p. 115) that :

[3] Two schools (U/B and V/B) shown in the Report with lower percentages are not public boarding schools.

"At ages under 5 the increase in mortality between 1921-5 and 1931-5 amounted to 72% for boys and 76% for girls; at 5-10 the rates of increase were 74 and 73% respectively, and 10-15 80 and 82%. At ages 15 and upwards the male death-rate increased in the same period from 8 to 21 per million or by 162%, and the female rate increased from 7 to 26 per million, or by 271%".

The review proceeds to point out the parallelism between recent movements of the rate and those of death-rates from septic diseases.

Tonsillectomy.—In 1932 Layton pointed out that the mortality directly due to tonsillectomy was greater than is usually appreciated. The Registrar-General's Statistical Review for 1935 includes a review of this mortality for the years 1931–1935. Enlarged tonsils or adenoids were given as the cause of 60 deaths, and tonsillectomy—without specification of the disease for which the operation was performed—was given as the cause of 513 deaths, 369 being deaths of children under 15. These numbers do not represent all the deaths following tonsillectomy in the five years, since deaths with mention of tonsillectomy in conjunction with the disease of the tonsils necessitating the operation are classified in tabulation to the particular disease mentioned and a considerable number of deaths following operations are therefore included under other headings in the table, such as enlarged tonsils. The number of deaths classed to diseases of the tonsils which occurred under or associated with anæsthesia are separately shown in Table C IV, p. 157, and corresponding tables for previous years, and the total of such deaths during 1931–1935 was 231, 140 of males and 91 of females. Dr. Stocks tells me that 85 of these 140 deaths of males and 56 of the 91 deaths of females (141 in all) were of children under 15.

From the following table it appears that at least 85 deaths of children under 15 occur on an average each year from tonsillectomy, and that, in all probability, this is a very conservative estimate.

TABLE VI*.—DEATHS FROM TONSILLECTOMY IN CHILDREN UNDER 15. 5-YEAR PERIOD 1931-5.

	Boys	Girls	Both sexes
Tonsillectomy (unqualified) ...	210	159	369
Adenoids	12	8	20
Enlarged tonsils	20	15	35
5-year period	242	182	424
Annual average	48·4	36·4	84·8

[Included in the above groups (or in other diseases of tonsils) are the deaths of 85 boys and 56 girls under 15 in which death occurred under or associated with anæsthesia.]

* *From the Registrar-General's Statistical Review for* 1935, *p.* 115, *and information kindly supplied by Dr. P. Stocks.*

In conclusion: I have endeavoured simply to present the incidence of tonsillectomy, and to avoid entering those other tempting paths of investigation, which others besides myself have pursued on previous occasions and in other places, such as the accepted indications for which tonsillectomy is performed, its risks, and the end-results achieved. I have also avoided any reference to the highly important question of sinusitis. A few comments have crept in, but in the main I have left the strange facts of incidence to speak for themselves.

SUMMARY

(1) The incidence of operations upon the tonsil remained low until after the beginning of the twentieth century. About 1902–1903 a rapid rise began, there was a partial lull during the War years, after which the rise accelerated sharply, reaching a peak in 1931. There was then a sharp fall. In 1936 a second rising curve began.

(2) The incidence is higher in boys than in girls.

(3) The highest age incidence is in the period 5–7 years, the peak being usually in the 6th year. The age distribution is somewhat older in girls than in boys.

(4) More attention should be given to sex—and, especially, to age-grouping in considering the necessity for operation, and in assessing its results.

The recent work of Epstein [10] and others suggests that the present age distribution is too young for the best results to be obtained.

(5) The high incidence between 5–7 years is due to many operations being performed on tonsils for enlargements which are either (*a*) physiological—associated with the great changes in development and in the oral cavity which takes place at this critical period; or (*b*) immunological—in response to the unaccustomed herd infections of the new environment of school, or to the sepsis sometimes resulting from the decay of the primary dentition.

(6) A study of the geographical distribution in elementary school children discloses no correlation between the rate of incidence and any impersonal factor, such as overcrowding, poverty, bad housing, or climate. Incidence is not correlated with the general efficiency of the school medical and dental services of the area. In fact it defies any explanation, save that of variations of medical opinion on the indications for operation.

(7) Large and, in some cases, drastic reductions in the numbers of operations performed in elementary school children in certain areas have had no unsatisfactory results.

(8) Puzzling as is the geographical distribution, the social distribution is yet more of an enigma. Tonsillectomy is at least three times as common in the well-to-do classes. The more fortunate the child in all other circumstances, and the better the opportunities for careful nurture, so much the more is he liable to tonsillectomy.

(9) In the public schools the picked athletes among the boys are tonsillectomized in exactly the same proportion as the other boys in the schools they represent.

(10) The mortality from the operation is larger than is generally appreciated.

(11) Though, as Dean [7] has recently said, "Practically the removal of tonsils is always a gamble" yet no impartial observer will deny that, in certain cases, tonsillectomy has brilliant results. "In a properly selected case there is no single operation in children's medicine more successful or that shows such dramatic results as that of tonsillectomy" (Paterson [24]). The facts enumerated above with regard to its incidence suggest that the conspicuous success of the operation in such cases has led to its adoption in many doubtful cases, and that it is too often performed without adequate cause, or sufficient regard to the possibility of enlargement being temporary, physiological, or immunological. With Paton [25] they seem to question "the justification for so widespread an attack upon a normal structure of the body", and to suggest that the probability that the tonsil serves some useful purpose, its tendency to spontaneous involution, and the success of non-operative methods of treatment are often alike overlooked in a too-hasty resort to "symptomatic treatment in its most elementary form" (W. H. Bradley [2]).

(12) The strange bare facts of incidence seem to support the opinion expressed on other grounds by the Schools Epidemic Committee [22] of the Medical Research Council that "it is a little difficult to believe that among the mass of tonsillectomies performed to-day all subjects for operation are selected with true discrimination, and one cannot avoid the conclusion that there is a tendency for the operation to be performed as a routine prophylactic ritual for no particular reason and with no particular result".

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Discussion.—The PRESIDENT said that the views expressed by Dr. Glover were consonant with the policy of the Board of Education which had repeatedly discouraged indiscriminate tonsillectomy. He himself had for many years held that the tonsils performed a useful function in the body and were a barrier to throat infections.

Unfortunately, it was still the honest belief of many practitioners that a large proportion of children should have their tonsils removed; this belief had spread to the laity and the influence of parental pressure could not be ignored.

It was sad to reflect that many of the anæsthetic deaths mentioned by Dr. Glover were due to the children's having undergone an unnecessary operation.

Mr. T. B. LAYTON said that his experience did not go back to 1903, the time at which Dr. Glover had found the first rise in numbers of these operations. In 1911, however, he had already begun to teach that too many were being done, for he remembered as a junior submitting to his Chief, Mr. F. J. Steward, whom he succeeded in the Throat Department at Guy's Hospital in 1912, the first draft of his paper, read before the Medical Society of London in March 1914.[4] Later he was away for four and a half years, and on his return to civil practice he found that the numbers of operations had increased to an enormous extent. He tried, he hoped impartially, to reconsider the whole subject to see whether his former views were wrong. He came to the conclusion that they were not, and found himself becoming more—not less—conservative. In the subsequent years this had continued, and he found himself advising tonsillectomy in children less and less.

He thought that the indication he had learnt from Hajek was the sound one. It was that if within one year there were three attacks—or two with joint pains—of acute inflammation of the tonsils which one felt confident were due to organisms living within them and not to any that were picked up from without, these organs should be removed. When one had this indication one was on sound ground. Whenever it was absent there was a possibility that one would not get the results from operation for which one hoped. He was quite willing to admit that there were many cases in which the operation had to be considered without this indication being present, but in all such cases he found it very difficult to decide.

[4] *Trans. Med. Soc. Lond.*, 1915, **37**, 244.

He believed that that was one of the reasons for so many operations being done. People thought it was an easy decision to make, whereas it was a very hard one, involving the weighing of pros and cons affecting not only the throat and the whole body, but also the conditions of life and the hygiene of the home. He thought that in every case at least as much time should be given to deciding whether any operation should be done, as to the doing of it. He had found that very often in making his decision it was certain contra-indications upon which he relied. Thus he did not believe it was right to operate upon children under the school age and would not do so unless the three attacks were definitely proven, which was very seldom at this time of life. But while he laid down 5 years as the definite rule, he found his mind subconsciously putting up the age as time went by; and he was now very loath to operate under the age of 10. In this connexion it had to be remembered that when the operation upon tonsils had first been advocated, the children upon whom it had been performed were the older ones at the period of the school-leaving age and not the young ones upon whom the operation was so often performed to-day. Then there was the question of the period of the year. In the days when many operations had been done in the out-patient department and the children had been sent home, Mr. Steward used to shut down all such operations during the winter. He (Mr. Layton) remembered him saying what an advantage that was, because one learned, by waiting, how many cases, especially of adenoids, were found not to need any operation at all. The logical evolution of this line of thought was that one should do no operations upon tonsils and adenoids in the winter months at all, and that was the rule that he now followed. When the L.C.C. had made arrangements so that no children were sent home for forty-eight hours after the operation he had felt that the Council was right and he had ceased to do tonsil and adenoid operations in the out-patient department at any time of the year. But while he had learned these principles from his seniors and employers there was one point that he had learned from his own experience as ear surgeon to the Fever Service of London. That was the devastating effect upon the ear that might result supposing measles developed in a child within a week of the tonsils being removed. So severe and so dangerous to life had been the conditions of mastoiditis that arose under these conditions that to-day he would not take out a child's tonsils during a measles epidemic unless the patient had already had that disease.

Turning to certain symptoms and diseases which had to be considered in the problem: He had learned in the throat clinic in Berlin to take the temperature just before the time for operation and to defer the operation if that was above 99° F. He did not believe that recurring colds were ever cured by tonsillectomy. It was true that after the operation certain children ceased to suffer from colds, but many children suddenly grew out of the habit of catching colds before operations on the tonsils were devised, and many parents were bitterly disappointed because, though they had been persuaded that the operation would stop their children catching colds, the colds had continued as before. He admitted that the question of acute rheumatism was a debatable one. There was one form of rheumatism, however, in which tonsillectomy might not only be valueless but definitely harmful, and that was chorea. When it was necessary to operate upon a choreic child, he first asked the physician to be sure that the disease was quiescent, and after the operation kept the child in bed behind screens until the faucial wounds were healed at the end of a fortnight. Even thus one was not quite safe, for two of the worst cases of chorea that he had ever seen had supervened upon tonsillectomy in children who previously had never been suspected of chorea or of any other form of acute rheumatic disease.

Finally he turned to the problem of hygiene. He did not suppose, except for one possibility, that the removal of the tonsils in the well-to-do, living under good hygienic conditions, did much harm; but he was convinced that in the children of the poor, living under conditions of bad hygiene, removal of the tonsils might be a very serious matter. He had known children after the operation go straight down hill and die without any obvious reason. They seemed merely to fade away. It was necessary to remember that those attending out-patient clinics to-day were not all poor. There were as many, and perhaps more, of those people living in little houses who, though they had to consider every penny of the weekly budget, were not poor. Their children were brought up under conditions of hygiene, as good, and perhaps better, than those of the most wealthy in the land. The difference with regard to tonsillectomy was not between those who paid for their children's education and those who took advantage of that provided by the State but between those whose

weekly income was sufficient to guarantee, under good management, a good standard of hygiene, and those whose uncertain daily takings could never guarantee this, however wonderful were the mothers—as so many of them were.

In his opinion no child living under conditions of overcrowding should ever have the tonsils removed if it could possibly be avoided. In those cases where he found it essential, usually under pressure from a colleague in another department, he arranged with the almoner for the child to be sent to a convalescent home for at least a month and then to be transferred direct to the ward where he kept it, as in the cases of chorea, for a full fortnight, after which it returned to the convalescent home for another month.

Mr. E. D. D. DAVIS said that the tonsil had a definite function, it was a specialized lymphatic gland, it had the structure of a lymphatic gland, and behaved like one. Owing to its exposed position it was specially susceptible to attacks of inflammation.

The classification of tonsillitis should be: (1) Primary; (2) Secondary.

Primary tonsillitis arose from infection from one patient to another, from infected milk, water or food, and it could be part of a general infection such as scarlet fever and measles.

Secondary tonsillitis arose from a septic focus such as septic teeth or nasal suppuration. Tonsillitis was sometimes secondary to sepsis following the extraction of teeth or a nasal operation.

When the tonsil was enucleated, its function was taken on by other lymphatic glands. Acute cervical adenitis was common and more severe in tonsillectomized patients. The function of the tonsil did not appear to receive sufficient consideration in the selection of cases for operation.

He agreed with Mr. Layton that measles arising soon after tonsillectomy and during convalescence after this operation was more severe and might lead to a dangerous otitis media and mastoiditis, but he did not think that measles and scarlet fever were more severe in a tonsillectomized patient who had completely recovered from the operation.

Dr. Glover had referred to the high incidence of tonsillectomy in new boys arriving at Public Schools in 1937. These boys would be about 6 years old in 1930-31, a period when the tonsillectomy incidence was very high, and further, 6 years was the age at which most tonsillectomies were performed.

More careful selection of cases for operation was needed. There was a great personal equation in such selection. The tonsil operation was performed by any and every surgeon, but he (Mr. Davis) firmly believed that the ear, nose, and throat, specialist was very careful in the selection of cases, taking at least twenty minutes in examining the patient, seeing the doubtful case again, and honestly trying to avoid unnecessary operation.

Dr. PERCY STOCKS said that Dr. Glover had presented a strong case. It appeared from the statistics that, at present rates, out of every 100 children born into all classes of England and Wales some 25 or 30 would be tonsillectomized before the age of 14. For comparison with this estimate the United States Public Health Report of April 22, 1938, contained an instructive record of all operation rates amongst 39,185 individuals taken from 18 States and all social classes, ascertained by family visitation over a period of four years 1928-31. From this sample it appeared that out of 100 children born 54% would have been tonsillectomized by their 14th birthday, assuming the rates during 1928-31 to be maintained. He (Dr. Stocks) confessed that Dr. Glover's paper made him feel rather despondent about some aspects of so-called "progress" and he thought that such a paper was long overdue. Twenty years ago about 50,000 tonsillectomies were being performed annually on elementary school children. Had a statistician at that time asked that a large control experiment should be arranged by giving and withholding the operation for alternate children and recording their subsequent school medical histories he would have been met by the usual answer: "If we believe that this treatment is beneficial, then it is unfair to withhold it from one half whilst giving it to the other half." He thought that the reply to such an objection was that in the absence of proof that a treatment is beneficial there is also no proof that it is not harmful, and there were signs of an awakening consciousness to that fact amongst the medical profession to-day. It took a long time to establish or disprove the efficacy of any new form of treatment, even by prearranged statistical studies, but thirty years was too long to remain

in doubt as to the value of a surgical treatment to which a quarter of the population was being subjected. It would not now always be easy for the school medical officer to persuade parents that the tonsils should be left alone. Nevertheless, that which courageous pioneers in Derbyshire and elsewhere had succeeded in doing, without the backing of such evidence as that which Dr. Glover and others had assembled, could and should now be done in all those parts of the country where the statistics showed that tonsillectomy was being practised in excess of the essential minimum.

Dr. R. P. GARROW said that some of the strange facts presented by Dr. Glover in regard to the incidence of tonsillectomy might be explained by a psychological factor of great importance—namely, maternal anxiety. Maternal anxiety varied with social circumstances, being greater amongst the better-off mothers who had fewer children. It was also, in his experience, greater in regard to boys than girls. This factor alone was sufficient to explain the higher incidence of unnecessary operations (of which tonsillectomy was the commonest) in boys than in girls and in the well-to-do as compared with the poorer classes.